

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Cancel claims 1-18

- [1. An ultrasonic clamp coagulator apparatus comprising:
a housing, said housing comprising an actuator;
an outer tube having a proximal end joined to said housing, and
a distal end, said outer tube defining a longitudinal axis;
an actuating element reciprocally positioned within said outer tube, said actuating element operatively connected to said actuator;
an ultrasonic waveguide positioned within said outer tube, said ultrasonic waveguide having an end-effector extending distally from said distal end of said outer tube,
wherein said end-effector comprises a broad edge and a narrow edge, wherein said narrow edge is defined by the intersection of a first surface and a second surface, wherein said first surface extends proximally into said end-effector defining a length of said first surface;
and
a clamp arm pivotally mounted on said distal end of said outer tube for pivotal movement with respect to said end-effector for clamping tissue between said clamp arm and said end-effector, said pivotal movement occurring about a horizontal axis, the arc of said pivotal movement of said clamp arm defining a vertical plane, said vertical plane having a vertical axis orthogonal to both said longitudinal axis and said horizontal axis, said clamp arm operatively connected to said actuating element so that reciprocal movement of said actuating element pivots said clamp arm along said vertical plane;
wherein said length of said first surface balances said waveguide such that excursion of said waveguide is minimized in said vertical plane.
2. An ultrasonic clamp coagulator apparatus according to claim 1, wherein excursion of said end-effector along said vertical axis is limited to less than 15 %.

Preliminary Amendment

S/N 10/047,601

3. An ultrasonic clamp coagulator apparatus according to claim 1, wherein excursion of said end-effector along said vertical axis is limited to less than 10 %.

4. An ultrasonic clamp coagulator apparatus according to claim 1, wherein excursion of said end-effector along said vertical axis is limited to less than 5 %.

5. A blade for an ultrasonic surgical instrument comprising:

a proximal end;

a distal end;

a broad edge; and

a narrow edge, wherein said narrow edge is defined by the intersection of a first surface and a second surface, wherein said first surface extends proximally into said blade from said distal end toward said proximal end, defining a length of said first surface;

wherein said length of said first surface balances said blade such that a secondary tip excursion of said blade is less than 15 % of the primary tip excursion of said blade.

6. An ultrasonic surgical instrument according to claim 5, wherein a secondary tip excursion of said blade is less than 10 % of the primary tip excursion of said blade.

7. An ultrasonic surgical instrument according to claim 5, wherein a secondary tip excursion of said blade is less than 5 % of the primary tip excursion of said blade.

8. An ultrasonic surgical instrument according to claim 5, wherein said first surface is concave.

9. An ultrasonic surgical instrument according to claim 6, wherein said first surface is concave.

10. An ultrasonic surgical instrument according to claim 7, wherein said first surface is concave.

11. An ultrasonic surgical instrument according to claim 8, wherein said second surface is convex.

12. An ultrasonic surgical instrument according to claim 9, wherein said second surface is convex.

13. An ultrasonic surgical instrument according to claim 10, wherein said second surface is convex.

14. A method of balancing an ultrasonic blade comprising the steps of:

- A) selecting a maximum acceptable level of undesirable blade excursion;
- B) adding a functional asymmetry to said blade by removing an amount of material from a portion of said blade along a length of said blade, wherein said length of said functional asymmetry satisfies said acceptable level of undesirable excursion identified in step A.

15. A method of balancing an ultrasonic blade according to claim 14, wherein said maximum acceptable level of undesirable blade excursion in step A is 15 % normalized excursion.

16. A method of balancing an ultrasonic blade according to claim 14, wherein said maximum acceptable level of undesirable blade excursion in step A is 10 % normalized excursion.

17. A method of balancing an ultrasonic blade according to claim 14, wherein said maximum acceptable level of undesirable blade excursion in step A is 5 % normalized excursion.

18. A method of balancing an ultrasonic blade according to claim 14, wherein in step B, said functional asymmetry is a narrow edge, wherein said narrow edge is defined by the intersection of a first surface and a second surface, wherein said first surface extends proximally into said blade from a distal end of said blade toward a proximal end of said blade, defining said length of said functional asymmetry; wherein said length of said functional asymmetry balances said blade such that a secondary tip excursion of said blade is less than 15 % of the primary tip excursion of said blade.]

Add new claims 19-29:

--19. An ultrasonic surgical instrument comprising:

an ultrasonic transmission member having a proximal end and a distal end;

an ultrasonically actuated blade attached to the distal end of the transmission member, wherein the blade comprises:

a distal end;

a proximal end attached to the transmission member at a longitudinal vibratory node point;

a treatment portion including at least one functional asymmetry defining a plane of asymmetry and having an ultrasonically actuated motion in substantially a single plane; and

a clamp member supported adjacent to the blade and having an open position in which at least a portion of the clamp member is spaced from the blade and a closed position in which the clamp member is adjacent to the blade and that the motion from the closed position to the open position occurs in a plane substantially perpendicular to the plane of motion of the blade.

20. The ultrasonic surgical instrument of claim 19, wherein the blade lies in a single plane perpendicular to the plane of asymmetry.

21. The ultrasonic surgical instrument of claim 19, wherein the treatment portion further comprises a balance asymmetry, wherein the balance asymmetry is positioned to counter torque created at the proximal end of the blade by the functional asymmetry.

Preliminary Amendment

S/N 10/047,601

22. The ultrasonic surgical instrument of claim 21, wherein the balance asymmetry is positioned such that transverse vibrations in at least one axis at the distal end of the blade are substantially equal to zero.

23. The ultrasonic surgical instrument of claim 21, wherein the balance asymmetry extends from the distal end of the blade to a point within the treatment portion.

24. The ultrasonic surgical instrument of claim 21, wherein the balance asymmetry extends from the distal end of the blade to a point proximal to the treatment portion.

24. The ultrasonic surgical instrument of claim 19, wherein the clamp member further comprises a tissue pad having a tissue contacting surface.

25. The ultrasonic surgical instrument of claim 24, wherein the tissue pad comprises grooves on the tissue contacting surface in a substantial perpendicular relationship with the functional asymmetry.

26. An ultrasonic surgical instrument comprising a ultrasonic waveguide having a proximal end and a distal end, wherein the waveguide comprises:

a balanced ultrasonically actuated blade positioned at the distal end of the waveguide and having an ultrasonically actuated motion in substantially a single plane, wherein the blade comprises:

a distal end;

a proximal end;

a curved treatment portion comprising a balance portion including at least one balance asymmetry, wherein the balance asymmetry is positioned to counter torque created by the curved treatment portion; and

a clamp member supported adjacent to the blade and having an open position in which at least a portion of the clamp member is spaced from the blade and a closed position in which the clamp member is adjacent to the blade and that the motion from

the closed position to the open position occurs in a plane substantially perpendicular to the plane of motion of the blade.

27. An ultrasonic surgical instrument comprising:

- a tubular sheath having a diameter, proximal end and a distal end;

- an ultrasonic transmission member having a proximal end and a distal end positioned within the tubular sheath;

- an ultrasonically actuated blade attached to the distal end of the transmission member and extending distally of the distal end of the tubular sheath, wherein the blade comprises:

- a distal end;

- a proximal end attached to the transmission member at a longitudinal vibratory node point;

- a treatment portion including at least one functional asymmetry defining a plane of asymmetry and having an ultrasonically actuated motion in substantially a single plane; and

- a clamp member configured to subscribe an arc larger than the diameter of the tubular shaft and supported adjacent to the blade and having an open position in which at least a portion of the clamp member is spaced from the blade and a closed position in which the clamp member is adjacent to the blade and that the motion from the closed position to the open position occurs in a plane substantially perpendicular to the plane of motion of the blade.

28. The ultrasonic surgical instrument of claim 27 further comprising a rotatable member operatively associated with the transmission member, the clamp member and the blade, the rotatable member being rotatable to cause corresponding rotation of the clamp member and the blade about a longitudinal axis of the instrument.

29. An ultrasonic surgical instrument of claim 27 further comprising a seal member positioned on the transmission member to dampen out unwanted torque generated by the functional asymmetry.--